Currently Amended Claims with Markings to Show Changes Made

1. (Currently amended) A hollow metal fitting for use in making a welded metal joint with reduced residual stresses, which fitting comprises

A. an internal annular shoulder having an inner diameter; and

B. an annular wall which

(1) extends from the shoulder,

(2) has a cylindrical inner surface,

(3) has a cylindrical outer surface whose diameter is greater than the inner diameter of the shoulder,

(4) defines with the shoulder a cylindrical socket having a common longitudinal axis with the annular wall, and

(5) has an end surface connecting the cylindrical outer and inner surfaces, which end surface is chamfered so that the inner surface extends away from the shoulder, and beyond the outer surface, in the axial direction and so that the end surface, as viewed in a cross section taken along the longitudinal axis of the annular wall, is concave.

2. (Original) A fitting according to claim 1 wherein the chamfered end surface terminates in an annular lip at the cylindrical inner surface of the annular wall.

3. (Currently amended) ~~A fitting according to claim 1 wherein~~ A hollow metal fitting for use in making a welded metal joint with reduced residual stresses, which fitting comprises

A. an internal annular shoulder having an inner diameter; and

B. an annular wall which

(1) extends from the shoulder,

(2) has a cylindrical inner surface,

(3) has a cylindrical outer surface whose diameter is greater than the inner diameter of the shoulder,

(4) defines with the shoulder a cylindrical socket having a common longitudinal axis with the annular wall, and

(5) has an end surface connecting the cylindrical outer and inner surfaces, which end surface is chamfered so that the inner surface extends away from the shoulder, and beyond the outer surface, in the axial direction and so that the end surface, as viewed in a cross section taken along the longitudinal axis of the annular wall, is concave, with the chamfered end surface ~~terminates~~ terminating, at the cylindrical inner surface of the annular wall, in an annular lip connected to an annular ring by thin, radially spaced bars which are parallel to the longitudinal axis.

4. (Original) A fitting according to claim 3 wherein the annular ring is thicker than the bars in a direction perpendicular to the longitudinal axis.

5. (Currently amended) ~~An assembly ready to be welded to form~~ A method of forming a socket-welded metal joint with reduced residual stresses resulting from the welding, which ~~assembly~~ method comprises

I. providing an assembly comprising

A. a hollow metal fitting which includes

(1) an internal annular shoulder having an inner diameter; and

(2) an annular wall which

(a) extends from the shoulder,

(b) has a cylindrical inner surface,

(c) has a cylindrical outer surface whose diameter is greater than the inner diameter of the shoulder,

(d) defines with the shoulder a cylindrical socket having a common longitudinal axis, and

(e) has an end surface connecting the cylindrical outer and inner surfaces, which end surface is chamfered so that the inner surface extends away from the shoulder, and beyond the outer surface, in the axial direction and has a profile such that, as viewed in a cross section taken along the longitudinal axis, there is an angle in the range of from 100 degrees to 120 degrees between the major portion of the end surface and said longitudinal axis; and

B. a metal pipe which includes at one end (1) a cylindrical outer surface which has a uniform radial profile and is free of any dam, pocket, projection, recess, or similar feature that could require the pipe to be configured, dimensioned, selected, or positioned to work with or otherwise correspond to a particular fitting, and (2) a cylindrical inner surface, with ~~one end~~ the endmost portion of the pipe at said end being disposed in the socket so that the outer surface of the pipe is within the inner surface of the annular wall of the socket; and

~~whereby the assembly is ready to be welded by an annular weld which adheres the chamfered end surface of the fitting to the cylindrical outer surface of the pipe~~

II. welding the fitting and the pipe together by applying an annulus of added bead metal to the chamfered end surface of the fitting so as to surround the chamfered end surface, and fusing the base metal of the annular wall and pipe.

6. (Currently amended) ~~An assembly~~ A method according to claim 5 wherein the outer surface of the pipe is cylindrical over its entire length.

7. (Currently amended) ~~An assembly~~ A method according to claim 5 wherein the chamfered end surface, as viewed in said cross section, includes a straight line.

8. (Currently amended) ~~An assembly~~ A method according to claim 5 wherein the chamfered end surface, as viewed in said cross section, is a straight line.

9. (Currently amended) ~~An assembly~~ A method according to claim 5 wherein the chamfered end surface, as viewed in said cross section, is concave.

10. (Currently amended) ~~An assembly~~ A method according to claim 5 wherein the chamfered end surface terminates in an annular lip at the cylindrical inner surface of the annular wall.

11. (Currently amended) An assembly ~~according to claim 5 wherein~~ ready to be welded to form a socket-welded metal joint with reduced residual stresses resulting from the welding, which assembly comprises

A. a hollow metal fitting which includes

(1) an internal annular shoulder having an inner diameter; and

(2) an annular wall which

(a) extends from the shoulder,

(b) has a cylindrical inner surface,

(c) has a cylindrical outer surface whose diameter is greater than the inner diameter of the shoulder,

(d) defines with the shoulder a cylindrical socket having a common longitudinal axis, and

(e) has an end surface connecting the cylindrical outer and inner surfaces, which end surface is chamfered so that the inner surface extends beyond the outer surface in the axial direction and has a profile such that, as viewed in a cross section taken along the longitudinal axis, there is an angle in the range of from 100 degrees to 120 degrees between the major portion of the end surface and said longitudinal axis and so that the chamfered end surface terminates, at the cylindrical inner surface of the annular wall, in an annular lip connected to an annular ring by radially spaced bars which are parallel to the longitudinal axis; and

B. a metal pipe which includes a cylindrical outer surface and a cylindrical inner surface, with one end of the pipe being disposed in the socket so that the outer surface of the pipe is within the inner surface of the annular wall of the socket;

whereby the assembly is ready to be welded by an annular weld which adheres the chamfered end surface of the fitting to the cylindrical outer surface of the pipe.

12. (Original) An assembly according to claim 11 wherein the annular ring is thicker than the bars in a direction perpendicular to the longitudinal axis.

13. (Currently amended) An assembly ~~according to claim 5 wherein~~ ready to be welded to form a socket-welded metal joint with reduced residual stresses resulting from the welding, which assembly comprises

A. a hollow metal fitting which includes

(1) an internal annular shoulder having an inner diameter; and

(2) an annular wall which

(a) extends from the shoulder,

(b) has a cylindrical inner surface,

(c) has a cylindrical outer surface whose diameter is greater than the inner diameter of the shoulder,

(d) defines with the shoulder a cylindrical socket having a common longitudinal axis, and

(e) has an end surface connecting the cylindrical outer and inner surfaces, which end surface is chamfered so that the inner surface extends beyond the outer surface in the axial direction and has a profile such that, as viewed in a cross section taken along the longitudinal axis, there is an angle in the range of from 100 degrees to 120 degrees between the major portion of the end surface and said longitudinal axis and so that the chamfered end surface terminates, at the cylindrical inner surface of the annular wall, in an annular lip spaced from an annular metal ring surrounding the pipe, which annular ring is separate from the fitting; and

B. a metal pipe which includes a cylindrical outer surface and a cylindrical inner surface, with one end of the pipe being disposed in the socket so that the outer surface of the pipe is within the inner surface of the annular wall of the socket;

whereby the assembly is ready to be welded by an annular weld which adheres the chamfered end surface of the fitting to the cylindrical outer surface of the pipe.

14. (Currently amended) A socket welded metal joint with reduced residual stresses resulting from the welding, which joint ~~comprises~~

~~A. a hollow metal fitting which includes~~

~~(1) an internal annular shoulder having an inner diameter; and~~

~~(2) an annular wall which~~

~~(a) extends from the shoulder,~~

~~(b) has a cylindrical inner surface,~~

~~(c) has a cylindrical outer surface whose diameter is greater than the inner diameter of the shoulder,~~

~~(d) defines with the shoulder a cylindrical socket having a common longitudinal axis, and~~

~~(e) has an end surface connecting the cylindrical outer and inner surfaces, which end surface is chamfered so that the inner surface extends beyond the outer surface, in the axial direction;~~

~~B. a metal pipe which includes a cylindrical outer surface and a cylindrical inner surface with one end of the pipe being disposed in the socket so that the outer surface of the pipe is within the inner surface of the annular wall of the socket; and~~

~~C. an annular weld which~~

~~(1) adheres the chamfered end surface of the fitting to the cylindrical outer surface of the pipe,~~

~~(2) includes both added bead metal and fused base metal of the annular wall and pipe, and~~

~~(3) has a profile such that, as viewed in a cross section taken along the longitudinal axis, there is an angle in the range of from 100 degrees to 120 degrees between (a) the major portion of the interface between said added bead metal and said fused base metal of the annular wall, and (b) said longitudinal axis~~ was made by a method according to claim 5.

15. (Original) A joint according to claim 14 wherein the outer surface of the pipe is cylindrical over its entire length.

16. (Original) A joint according to claim 14 wherein the interface between said added bead metal and said fused base metal of the annular wall and the pipe, as viewed in said cross section, includes a straight line.

17. (Original) A joint according to claim 14 wherein the interface between said added bead metal and said fused base metal of the annular wall and the pipe, as viewed in said cross section, is a straight line.

18. (Original) A joint according to claim 14 wherein the interface between said added bead metal and said fused base metal of the annular wall and the pipe, as viewed in said cross section, is concave.

REMARKS

Status of Claims

Claims 1-18 are in the application. Claims 3, 4, and 11-13 have been indicated allowable. Claims 1, 2, 5-10, and 14-18 stand rejected.

General Approach to Amendments

The Amendment to the title makes it more concise. Replacement paragraph 0036 and revised Fig. 6 identify more clearly the angle specified in claim 5. New paragraph 0048.1 reflects the language that has been added to claim 5, as will be discussed below. New paragraph 0048.1 clarifies that the angle specified in claim 5 is not limited to Fig. 6.

Allowable claims 3, 4, and 11-13 have been re-written in independent form or depend from an allowed independent claim. Claims 5-10, the rejected claims directed to an assembly, have been converted to method claims consisting of the steps of providing the assembly and then welding the fitting and pipe together. Claim 14 has been converted to a product-by-process claim depending from claim 5. Other amendments have been made to the claims to distinguish from the cited references, as will be discussed below.

Boice Patent

Claims 5-10 and 14-18 have been rejected under 35 U.S.C. 103 as unpatentable over Boice U.S. patent 2,633,374.

Boice discloses joining female tool joint A to well drilling pipe 10 by brazing. One end of tool joint A is threaded for threaded connection with a corresponding male tool joint. The other end of tool joint A comprises cylindrical body portion 11 with bore 17 which receives pipe 10 so that pipe end 10b abuts internal annular shoulder 18 of tool joint A. Fingers 15 with slots 14 between them extend from body portion 11. A ring of brazing material 19 is placed on shoulder 18, and when the pipe is inserted in the joint, is

retained in annular recess 10a in the end of the pipe. Additional brazing material 20 is added to the interface between the tool joint and the pipe by introduction though slots 14, and finally ring 21 of brazing material is added to the endmost surface of the tool joint. Next the assembly is placed in a brazing furnace, heated until the brazing material is melted and distributed, and then removed and allowed to cool. Boice does not disclose any welding or, with the exception of ring 19 of brazing material, depositing any material on the exterior surfaces of the tool joint or pipe.

Applicant does not agree with the Examiner's reading of the Boice patent on the claims, but in order to clearly distinguish from Boice the rejected claims to the assembly have been rewritten to be method claims. These claims now include a "welding" step which clearly is not disclosed or suggested in Boice and is not even compatible with Boice.

Brown Patent

Claims 5-8 and 14-17 have been rejected under 35 U.S.C. 103 as unpatentable over Brown U.S. patent 2,037,962. (Applicant assumes that the reference to "Boice" in this rejection is intended to be "Brown".)

Brown discloses a welded pipe joint of the bell and spigot type. Spigot 6 at the end of pipe 5 fits within bell 11 of pipe 10, with frustoconical end 9 of pipe 5 mating with internal shoulder surface 13 of pipe 10 when the pipes are assembled. Bell 11 ends in chamfer 14 having a straight line cross-sectional profile.

Spaced from end 9 of pipe 5 is shoulder 7 with frustoconical face 8. The location of shoulder 7 along the length of pipe 5 is selected so that the radially innermost portions of shoulder surface 8 and chamfer 14 abut when the pipes are assembled for welding, so that annular weld 14 has a V-shaped cross-sectional profile. This base of this profile appears to be an angle of about 90 degrees.

While the end structure of Brown's pipe 10 and bell 11 correspond to the claimed fitting, the amended claims distinguish from pipe 10 with integral shoulder 7 by requiring that the claimed pipe include

> a cylindrical outer surface which has a uniform radial profile and is free of any dam, pocket, projection, recess, or similar feature that could require the pipe to be configured, dimensioned, selected, or positioned to work with or otherwise correspond to a particular fitting

This claimed feature eliminates the need for Applicant's pipe to be designed and manufactured to be used only with fittings of a particular structure. Moreover, Applicant's invention enables the pipe to be "standard" and to be cut to length as desired for a particular apparatus or installation. In addition, Applicant's invention prevents the pipe from having to be supplied with particular configurations at its opposite ends, for example, male-male, male-female, and female-female. This latter point is illustrated in Attachment I, which consists of Figure A depicting three pipes according to Brown and Figure B depicting three pipes according to Applicant's invention. It should be noted also that Length L in Figure A must be predetermined when the pipe is manufactured.

Further, if Brown's shoulder 7 is eliminated, the resulting structure would not fall within the range of 100 degrees to 120 degrees recited in claim 5. This would be true whether (i) the 90 degree angle of Brown's weld profile is retained, or (ii) the angle between Brown's shoulder surface 8 with the pipe's longitudinal axis is retained. Of course, there is no suggestion in Brown for either (i) or (ii).

Brown patent in view of Kane Patent

Claims 1,2, 9,and 18 have been rejected under 35 U.S.C. 103 as unpatentable over Brown U.S. patent 2,037,962 in view of Kane U.S. Patent 2,130,587.

Kane, like Brown, discloses a welded pipe joint of the bell and spigot type. As shown in Figs. 2 and 3, lower pipe 12 has bell portion 13 which receives spigot portion

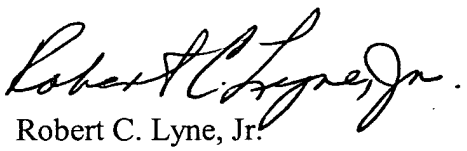
15 of upper pipe 16. As shown in Fig. 3, shoulder 21 of spigot portion 15 abuts shoulder 40 of bell portion 13. Upper end 20 of bell portion 13 ends in bevel 25 which is an undercut with an ogee contour. Immediately adjacent to bevel 25 is groove or channel 19 in upper pipe 16. Bevel 25 and groove 19 are configured so that they form together annular pocket 18. Welding material 35 is deposited in pocket 18, which has a size and shape such that the welding rod can be inserted into it. Apparently these pipes are being welded together in the field, in their vertical position in the drill pipe string shown in Fig. 1, and the pockets serve to contain the molten weld material.

The Examiner has applied Kane to the claims which recite that the chamfer is concave, since the chamfer in Brown has a straight line profile.

Applicant submits that there is no suggestion or motivation to add the teachings of Kane to those of Brown, and even if somehow combined, the combination of Brown and Kane still does not produce the structure required by the claims. First, Brown already has chamfer 14 and shoulder 7 which can serve as dams to contains the weld material, and thus has already solved that problem. There is no reason to look for another, different, solution. Second, claims 1and 5 have been amended to recite specifically that the chamfer is such that the inner surface of the fitting's annular wall extends away from the shoulder and beyond the annular wall's outer surface in the axial direction, and thus cannot be interpreted to read on a reverse chamfer or undercut as disclosed in Kane. Third, pipe section 16 must have groove 31 in order to enable the weld material to resist shear forces, as described at page 3, col. 1, lines 24-37. This groove prevents the pipe with the spigot from being a standard pipe and requires the spigot-ended pipe section to be configured, dimensioned, selected, and positioned to work with the specific bell-ended pipe, as discussed above in connection with Brown. Fourth, the Brown component of this rejection is not proper for the reasons given with respect to the rejection based on Brown alone.

For the convenience of the Examiner, Applicant is submitting as Attachment II a table showing claims, references, figures, and embodiments, which Applicant used in organizing this response. Allowed claims are identified by highlighting.

Respectfully submitted,



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